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Main Patent

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Antibiotic compound intended for the treatment of comestible poultry with the aim of prolonging its preservation period

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The present invention is a compound intended for the treatment of comestible poultry with the aim of prolonging its preservation period. In the poultry industry, freshly slaughtered poultry is usually placed in icy water for a period ranging from 30 minutes to 4 hours, with the aim of lowering the poultry's temperature and thus to reduce subsequent bacteria growth to a minimum. The chilled poultry is then removed from the icy water, and subsequently packaged according to normal methods and distributed. If the poultry is not frozen, which is non-economical and non-desirable for other reasons, decomposition happens very quickly in such a way that the flesh soon becomes non-comestible. Therefore, poultry treated in this way could only be distributed within a limited radius, not easily controllable by hygiene service inspectors.

Tarr et al. used antibiotics to preserve fish, and Deatherage et al. used antibiotics to preserve beef. Kohler et al. described in Food Technology, Volume 8, May 1954, page 19, that chlortetracycline prolongs the preservation period of poultry from 7 to 14 days, if one submerges freshly slaughtered poultry in water containing 3 to 30 parts per million chlortetracycline, and keeps them at a temperature of 4.5°C.

We have now observed that by dissolving tetracycline in concentrations of approximately 1,000 to 10,000 parts per million and by maintaining a temperature close to that of the hennery (32°) or to the ambient temperature (21°C), a foam forms during the dissolution, and thereafter, the solution turns cloudy and a precipitate occurs when it is laid to rest. Also, we have seen that in deionised water, the formation of foam and precipitate do not occur, and the solution does not turn cloudy. It is however inexplicable for what reason the formation of foam and the precipitate do not occur and why the solution does not turn cloudy. Perhaps this is due to a certain decomposition of the antibiotic. On the other hand, it is also possible for an insoluble form of the antibiotic to form in normal water. In any case, this results in a loss of soluble antibiotic. Seeing as the antibiotic is expensive, it is of course essential to prevent the possibility of such losses. Furthermore, it is also desirable for the antibiotic solution sold to consumers to have the desired and recommended efficacy.

The goal of the present invention is therefore an antibiotic solution for the treatment of comestible poultry with the aim of prolonging its preservation period, using a mixture of chlortetracycline, and/or tetracycline, and/or oxytetracycline, and/or an acidic or metallic salt soluble in their water, and/or of a complex that is soluble in the water of one of these antibiotics and of at least one solid, non-toxic acid soluble in water.

When one uses such water soluble non-toxic solid acids in combination with the antibiotic, there is no resulting foam formation, cloudiness or precipitate. This is the case, for example, in the presence of 1,000 parts antibiotic per million, and of 5,000 and 10,000 parts per million. The highest mentioned value approaches the solubility limit of hydrochloride of chlortetracycline in deionised water. Even at this concentration, when in the presence of the added acid, there was no foam formation, cloudiness or precipitate after the solution was laid to rest in normal water or hard water for about 16 hours.

It is almost certain that this phenomenon is in no way due to the effect of the acid's pH. This can be seen in the table that will follow comparing the results obtained with deionised water containing no acid, whose pH is similar to solutions of normal water containing no acid. The following table also shows that the pH of the antibiotic solutions not containing citric acid was very close to that of those containing citric acid. In certain cases, the difference in the pH

values obtained with or without citric acid is very low. It may be that the antibiotic was precipitated in the form of a free base. However, this hypothesis is refuted in the following tables, which prove that formation of foam, precipitate etc. occur at high temperatures (21° and 32°C) at which the free base is perfectly soluble. Furthermore, this hypothesis is refuted even more strongly when one takes into consideration the fact that there is no cloudiness, precipitate or foam formation at a temperature of about 4°C, at which one could expect the free base to separate from the solution. For these reasons, one could conclude that the acid should not be able to prevent this undesirable loss of antibiotic in the solution.

As it is easily obtainable in the industry, hydrochloride is generally used as the acid salt for the antibiotics. Other acid salts are also interesting, such as sulphate. Sodium and potassium salts are notable examples of metallic salts. Other derivatives have also been successfully used. These antibiotics form compounds with aluminium, see American patents N°2 640 842 and N°2 736 725. The compounds described in these patents can be used in the compound described by the present invention. Thus, one can use for example, a compound of chlortetracycline and aluminium citrate, or a compound of chlortetracycline and aluminium gluconate, etc. Chlortetracycline is the preferred choice, as it is destroyed when the poultry is cooked. Hydrochloride is the preferred product as it is easily obtainable.

With regards to the acid, citric acid, gluconic acid, tartric acid, lactobionic acid, malic acid, ascorbic acid and itaconic acid can be used.

The amount of acid compared to the antibiotic can be from 1 to 3 parts of acid to 1 part of antibiotic, measured by weight. The compound according to the invention is constituted initially of a dry mixture containing, preferably, the antibiotic, the acid, and a small quantity of an inert tensioactive and non-toxic agent, while the rest is composed of an inert, non-toxic, water soluble thinner.

As moistening agent, or tensioactive agent, one can use the ester of a fatty tensioactive and non-ionic acid of superior polyglycols, such as dipropylene glycol monooleate, also known as “Nonisol”, and marketed by Alrose Chemical Company, Providence, Rhode Island, or also “Pluronics”, sold by Wyandotte Chemical Company. “Pluronics” follow the following formula:

$HO(C_2H_4O)_x(C_3H_6O)_y(C_2H_4O)_xH$

in which x = 3.4 to 18.5 and y = 2.6 to 24.8. Another example of non-toxic moistening agents on the market is the "Tweens" group of the Atlas Powder Company. "Tween 80" has proven to be the preferred moistening agent for the present invention; it contains polyoxyethelene sorbitan monooleate. The thinner can be chosen among thinner that are non-toxic, inert and water soluble. We have noticed that sugar and sodium chloride can be used to this effect. Sodium chloride is the preferred agent. Obviously, other tensioactive thinning agents known by industry people can be used. As indicated, the preferred compound contains one of the mentioned tensioactive agents, and one of the mentioned thinners. However, neither the thinner nor the tensioactive agents are necessary.

According to the invention, the compound preferably contains 3 to 30% in weight of antibiotic, 3 to 30% acid, about 1% of tensioactive agent, with the rest being composed of thinner. One prefers the compound containing about 10% chlortetracycline, about 10% citric acid, about 1% "Tween 80" (polyoxyethelene sorbitan monooleate) and about 79% sodium chloride (the percentages indicating weights).

In practice, the dry compound described above can be diluted with water to produce a storage solution containing about 1,000 parts per million antibiotic agent. This concentration of antibiotic agent in the storage solution can reach up to 10,000 parts per million in weight and can be thinned, for example, to 500 parts per million in weight. However, a concentration of 1,000 parts per million in weight is preferred, given that, when one goes below 100 parts per million, the volume of liquid becomes excessively large and difficult to handle. If one goes to the other extreme, that is above 10,000 parts per million, the antibiotic agent becomes difficult to dissolve in water.

The recommended concentration of antibiotic agent in the solution, in which the poultry must finally be submerged, can be included between 3 and approximately 30 parts per million. A concentration of antibiotic agent of approximately 10 parts per million is preferred. Therefore, when preparing the solution in which the poultry is to be submerged, a sufficient quantity of storage solution can be poured in water to form a solution containing about 10

parts per million antibiotic agent. In following this procedure, one obtains a solution in which to submerge the poultry consisting of water containing approximately 10 parts per million antibiotic agent, approximately 10 parts per million citric acid, approximately 1 part per million non-toxic tensioactive agent and approximately 79 parts per million inert, non-toxic, water soluble thinner. That is the preferred compound of the soaking solution. Obviously, the quantities indicated for the different constituents can vary. The quantity of antibiotic agent should normally not exceed 30 parts per million, as quantities in excess of this are not always eliminated while cooking. On the other hand, the effect is not sufficiently effective, if one goes below 3 parts per million. Obviously the cost of the antibiotic agent and of the other constituents is an important consideration in determining the quantities to be used in the soaking solution. Therefore, it is recommendable to use approximately 3 to 90 parts per million citric acid, approximately 0.3 to 3 parts per million tensioactive agent and approximately 60 to 240 parts per million of inert solution that is water soluble.

The soaking procedure is as follows: the freshly slaughtered poultry is submerged, after having been cleaned, in a bath of icy water containing the soaking solution described above. When the flesh has been sufficiently chilled, it is removed from the bath, packed according to normal methods, after which the poultry can be distributed to the market.

The poultry must normally remain in the soaking solution for at least 30 minutes. During this period, the flesh of the poultry absorbs sufficient antibiotic matter to guarantee adequate protection. A longer period, going up to several hours, is preferred, as a greater quantity of antibiotic agent is then absorbed. Thus, a period of 2 hours is preferred. It is not suggested to wash the poultry after the soaking procedure, as the antibiotic agent present on the surface retards bacteria growth. Thanks to the longer preservation period coming from the use of this procedure of soaking the poultry in antibiotic agent, it becomes possible to package the poultry individually at the place where the procedure is conducted. Packaging individually in this way is advantageous because the antibiotic agent is not eliminated from the poultry's surface and that the poultry is not contaminated by bacteria during handling in getting it to the consumer.

In order to illustrate the advantages of the present invention, several tables

showing the efficacy of the described procedure are presented. The results are expressed quantitatively by the number of micro organisms per cc of solution and determined in the following way. Each chicken weighing about 1kg is submerged carefully into 1 litre of distilled sterile water for 5 minutes, after which one submerges it 10 more times in the same water. It is then left to drip and put aside. The rinsing water then contains the majority of the surface micro organisms that were found on the chicken. According to the degree of deterioration, the rinsing water is diluted with sterile water and 1cc of each of the desired diluted solutions is added to test tubes containing nutrient agar. The test tubes are then introduced in sterile Petri dishes. When the agar is hard, the dishes are flipped and stored for 48 hours at ambient temperature (24°C), after which individual colonies are counted. The results are enumerated in the following table:

Table I

Effect of soaking poultry in a chlortetracycline solution to preserve it longer

Poultry storage time (days on ice) 3°C	Soaking solution containing chlortetracycline* parts per million	Micro organisms per cc (thousands)	Comments of a trial panel of 45 families
0	0	1,58	Excellent condition
	10	1,58	Excellent condition
7	0	520	Excellent condition
	10	1	Excellent condition
14	0	605,000	Slight odor, unacceptable for sale
	10	10	Excellent condition
21	0	3,700,000	Sticky, putrid odor, objectionable
	10	770	Good; acceptable (no odor / does not become sticky)

(*) in the form of hydrochloride of chlortetracycline

The following operations were conducted in order to demonstrate the physical properties of the antibiotic agent in combination with acid; (1) hydrochloride of chlortetracycline was added to demineralised water in concentrations of

10,000 ppm, 5,000 ppm and 1,000 ppm. (2) Solutions of the same concentration were used, which were obtained using water from Pearl River. (3) Solutions of the same concentration were used, which were obtained using hard water containing approximately 200mg of $CaCl_2$ and 500 mg of MSO_4 per litre. Equal parts of each of the above solutions were stored at 4.5°C, 21°C and 32°C. The trials, (1), (2) and (3) mentioned above were also repeated, with the difference that a quantity of citric acid equal to the quantity of chlortetracycline was added to each vial. The results are enumerated in the following tables:

Table II

Physical observations

		Formation of foam
1. Deionised water	10,000 ppm	-
2. Fresh water	10,000 ppm	+
3. Hard water	10,000 ppm	+
4. Deionised water	5,000 ppm	-
5. Fresh water	5,000 ppm	+
6. Hard water	5,000 ppm	+
7. Deionised water	1,000 ppm	-
8. Fresh water	1,000 ppm	+
9. Hard water	1,000 ppm	+
10. Deionised water	10,000 ppm + citric acid	-
11. Fresh water	10,000 ppm + citric acid	-
12. Hard water	10,000 ppm + citric acid	-
13. Deionised water	5,000 ppm + citric acid	-
14. Fresh water	5,000 ppm + citric acid	-
15. Hard water	5,000 ppm + citric acid	-
16. Deionised water	1,000 ppm + citric acid	-
17. Fresh water	1,000 ppm + citric acid	-
18. Hard water	1,000 ppm + citric acid	-

The "-" symbol indicates no formation of foam, while the "+" symbol indicates the formation of foam.

Table III

Cloudiness and/or precipitate after resting overnight (15 hours)

			Without citric acid			
			Deionised water	Fresh water	Hard water	pH
1.	10,000 ppm	4.5°C	-	-	-	2.7
2.	10,000 ppm	21°C	-	+	+	2.6
3.	10,000 ppm	32°C	-	+	+	2.8
4.	5,000 ppm	4.5°C	-	-	-	2.8
5.	5,000 ppm	21°C	-	+	+	2.8
6.	5,000 ppm	32°C	-	+	+	2.9
7.	1,000 ppm	4.5°C	-	-	-	5.1*
8.	1,000 ppm	21°C	-	+	+	5.1*
9.	1,000 ppm	32°C	-	+	+	5.1*
10.	10,000 ppm	4,5°C	-	-	-	2.2
11.	10,000 ppm	21°C	-	-	-	2.3
12.	10,000 ppm	32°C	-	-	-	2.2
13.	5,000 ppm	4,5°C	-	-	-	2.5
14.	5,000 ppm	21°C	-	-	-	2.5
15.	5,000 ppm	32°C	-	-	-	2.5
16.	1,000 ppm	4,5°C	-	-	-	2.8
17.	1,000 ppm	21°C	-	-	-	2.8
18.	1,000 ppm	32°C	-	-	-	3.0

The "-" symbol indicates no precipitate or cloudiness, while the "+" symbol indicates the presence of precipitate, cloudiness or both. (*) These pH values are valid for hard water only. In deionised water at 1,000 ppm, the pH for each of the three temperatures was 3.3. In fresh water at 1,000 ppm, the pH for each of the three temperatures was 3.9. All other 15 pH values have the pH as indicated in the table for deionised water, fresh water and hard water, with a variation of +/- 0.2 per unit.

Hydrochloride of oxytetracycline and hydrochloride of tetracycline were also examined under identical conditions to those described in tables II and III, and similar results were obtained. Formation of foam and precipitate observed with hydrochloride of oxytetracycline was more pronounced than with the other antibiotics.

With fresh water and hard water, a persistent and voluminous foam was formed when shaking vigorously. The formation of this foam could be avoided (1) by using deionised water and (2) by using citric acid. After 15 hours, a dark brown precipitate was observed in each of the fresh water and hard water solutions stored at 21 and 32°C; no precipitate was observed if these solutions contained citric acid. Consequently, the formation of precipitate can be prevented in the following ways: 1. refrigeration of the concentrate; 2. use of deionised water and 3. use of citric acid. In addition, it was observed that the quantity of precipitate increased at both higher temperatures and with higher ion concentrations.

N.B. – The patent does not represent an authorisation for the industrial use of the invention.

Claim I

Antibiotic compound for the treatment of comestible poultry with the aim of prolonging its preservation period, characterised by the fact that it contains a mixture of chlortetracycline, and/or tetracycline, and/or oxytetracycline, and/or an acid or metallic salt soluble in their water, and/or a water soluble complex of these antibiotics and at least one water soluble, non-toxic solid acid.

Sub-Claims

1. Compound as in Claim I, characterised by the fact it contains citric, gluconic, tartric, lactobionic, malic, ascorbic or itaconic acid.

2. Compound as in Claim I and Sub-Claim 1, characterised by the fact it contains 1 to 3 parts by weight of the said acid per part of the said antibiotic agent.

3. Compound as in Claim I and Sub-Claims 1 and 2, characterised by the fact it contains at least one inert, non-toxic, water soluble thinner.

4. Compound as in Claim I and Sub-Claims 1 to 3, characterised by the fact it contains an inert, non-toxic, tensioactive agent.

5. Compound as in Claim I and Sub-Claims 1 to 4, characterised by the fact it contains hydrochloride of chlortetracycline or sulphate of chlortetracycline.

Claim II

Use of the compound as described in Claim I, for the treatment of poultry, with the aim of prolonging its preservation period, characterised by the submersion of freshly slaughtered poultry in a liquid solution of the said composition.

Sub-Claim

6. Use as described in Claim II, characterised by the fact the said compound is present in a quantity so that the liquid solution contains 3 to 30 parts per million by weight of the said antibiotic agent.

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